

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

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Terrestrial Use of the 2473-2495 MHz Band for)	IB Docket No. 13-213
Low-Power Mobile Broadband Networks;)	RM-11685
Amendments to Rules for the Ancillary Terrestrial)	
Component of Mobile Satellite Service Systems)	
)	

Ex Parte Filing of Etymotic Research Inc.

Etymotic Research Inc. is a manufacturer of products for people with hearing loss and to enhance people's listening experience. Our various products use Bluetooth or our own proprietary RF protocol, but they all operate in the 2.4 GHz ISM band. Therefore, we have an interest and concern about any changes to this band and the electromagnetic environment in which our products operate.

In November of 2012, Globalstar petitioned the FCC for a rulemaking to enable them to create a Terrestrial Low Power Service (TLPS), using their MSS-license spectrum in 2483.5 to 2495 MHz, and to allow them to extend that service into the 2473 to 2483.5 MHz band.

We have reviewed their proposal and testing filed in this docket. We share the concerns expressed by Microsoft that there is not sufficient technical specificity to allow a thorough analysis of the system's impact on other users of the band, such as our Etymotic Research products. However, if the system operates to the limits of the proposed FCC rules in this docket, there is considerable reason for concern that an

excessive level of harmful interference would result. We share in this regard the concerns of the Bluetooth SIG and others.

We have read the proposal of the Hearing Industries Association (HIA) that more testing, conducted under the supervision of a neutral third party, such as ANSI ASC C63[®] is needed. It may be possible, as HIA states, to find ways to mitigate the risk of harmful interference to acceptable levels. We would welcome such a result.

We observe with grave concern Globalstar's representations about lack of impact to audio quality. Assessing the psychoacoustic impact of interference is a specialized topic. The impact of interference on people with normal hearing is different from that on people with hearing loss. People with hearing loss not only lose the ability to hear soft sounds, they commonly lose their ability to understand speech in noise levels that are not a problem for normal-hearing people. As a result, hearing-impaired persons are more sensitive to noise and interference. Further, hearing loss can be frequency dependent, making broad generalizations particularly troubling. Someone with severe high-frequency loss may start out with only half of the speech cues audible to them that are important to intelligibility. Someone with normal hearing needs only 25% of the speech cues available above the masking of interfering noise. Someone who starts with only half of the speech cues audible needs twice as many cues for optimal speech understanding in noise. Interference that seems tolerable to someone with normal hearing may make speech completely unintelligible to someone who starts out with only half the cues because of their hearing loss. The potential impact for children with hearing loss is different from that of adults. We would bring to the Commission's attention comments of

the UK Children's FM Working Group to Ofcom in an issue in the UK impacting the 2.4 GHz ISM band:

- The assertion that there is minimal interference is based on a model that fails to understand the implications of permanent deafness. Children do not gain adult like hearing abilities (for example to listen in noise) until their late teens. Deaf children may never gain such abilities. Any level of interference is significant and has lifelong implications. Deaf children rely on radio amplification for access to speech in any poor listening environment, including schools. Interference with such systems has lifelong implications for this group of vulnerable children. Any additional effort required to listen reduces cognitive effort for other areas and places limits on deaf children.
- Deafness potentially isolates individuals and reduces their quality of life. The use of hearing aid technology currently offers more opportunities than at any other time in history. Assistive listening devices (ALD) offer access to wider society and to the workplace. Interference with such devices, reduces access to society and the opportunities this brings and is likely to result in poor hearing aid compliance.
- Lack of use of amplification has been estimated to equate to 22Billion Euros in the UK, rising to 213 Billion Euros across Europe (Shield, 2006).¹

The Commission should insist that any representations of sound quality be supported by those with recognized expertise in audio quality measurements and psychoacoustics.

Further the Commission should be sensitive to the differences in impact to people with hearing loss and insist that representations about audio quality in hearing aids and assistive listening devices be made only with the supervision of those with the required expertise in the audio quality needs of people with hearing loss and the differences in the needs of adults and children with hearing loss. Etymotic Research has such experience,

¹ UK Children's FM working group, Response Comments to Ofcom's Public Sector Spectrum Release, award of the 2.3-3.4GHz spectrum, posted 5 Feb 2015, updated 5 Feb 2015. Accessed on July 16, 2015 at: <http://www.fmworkinggroup.org.uk/>

and indeed, developed the QuickSIN test, which is most often used for evaluating the ability to understand speech in noise. More importantly, there are many university groups familiar with the techniques needed to evaluate the effect of interference on speech intelligibility. (University of Iowa, University of Pittsburgh and even Northwestern University, where Etymotic's CTO has taught a course for 32 years).

We also are concerned that several factors may lead to some broad misconceptions that could impact the perception of the impact Globalstar TLPS system. One of those factors is the misleading result that can arise from spectrum survey measurements. Because WiFi operates at approximately 10 times the power of Bluetooth or Bluetooth LE and because it uses a very different and more continuous transmission pattern, spectrum research can result in the impression that use of the 2.4 GHz ISM band is dominated by WiFi. In fact, lower-power Bluetooth and Bluetooth LE products have been far more numerous than WiFi devices. We realize there are some recent trends which have narrowed the gap. Looking only at spectrum measurements has led to the impression that concern about WiFi interference is the dominant concern. However, Bluetooth, Bluetooth LE and similar low-power devices are both more numerous and have a greater vulnerability to be impacted. The Commission should be cautious to separate this impression from measurements of RF transmissions from the most impacted device segment.

We would further caution that WiFi, Bluetooth and Bluetooth LE should be treated as separate cases. These three protocols are important, each in their own right, and their vulnerability to interference is sufficiently different that each should be evaluated separately. The similarity in name between Bluetooth and Bluetooth LE

perhaps implies that their characteristics are similar. In fact, particularly for this issue, the interference vulnerability is very different for these two categories of devices. Both are widely used and each should be evaluated separately.

As a company we have been and continue to be enthusiastic supporters of advancing technology and supporting innovation. Indeed, Etymotic was the first to present dramatic video evidence of the interference problem at the 1994² meeting called by FCC Chairman Hunt, after GSM was first introduced in Washington DC and many hearing aid wearers found it impossible to use the new GSM cellphones because of the extremely strong 226 Hz buzz introduced in their hearing aids even when they stood near someone using a GSM cellphone. We are hopeful that many innovations may be evaluated using a rigorous risk assessment and management approach to allow the innovations to be deployed but with adequate safeguards to insure that risks are bounded to acceptable levels. We appreciate Gerst Capital's discussion of the FCC TAC's excellent paper entitled "A Quick Introduction to Risk-Informed Interference Assessment, released in April.² We believe the use of rigorous risk assessment and management methodologies offer a path forward in many issues including this one.

While we are generally supportive of innovations and more efficient use of the radio frequency spectrum, we believe the risks and impact of any innovation must be well understood before an innovation is released. In this docket we find there is a general lack of technical specificity as to what will be deployed or the limits on how TLPS systems may develop over time. Further, we find the testing reported in the record to be inadequate and specifically inadequate in evaluating the potential impact on products that communicate audio and voice, in particular products supporting the needs of people with

² <https://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting4115/Intro-to-RIA-v100.pdf>

hearing loss. Therefore, until such time as there is clear and compelling evidence that consumers of Etymotic products, which enable them to continue living independently will not be harmed by changes in regulations, we are strongly opposed to the FCC approving the Globalstar proposal.

Respectfully submitted,

Etymotic Research Inc.

By: _____
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Date: 19 July 2015